Compiler Design

EXPERIMENT 3

Sai Ram Pendyala

RA1911003010696

AIM:

A program for Elimination of Left Recursion.

ALGORITHM:

1. Start the program.
2. Initialize the arrays for taking input from the user.
3. Prompt the user to input the no. of non-terminals having left recursion and no. of productions for these non-terminals.
4. Prompt the user to input the production for non-terminals.
5. Eliminate left recursion using the following rules
    a. A->Aα1| Aα2 | . . . . . |Aαm
    b. A->β1| β2| . . . . .| βn
    c. Then replace it by
    d. A-> βi A’ i=1,2,3,…..m
    e. A’-> αj A’ j=1,2,3,…..n
    f. A’-> Ɛ
6. After eliminating the left recursion by applying these rules, display the productions without left recursion.
7. Stop.

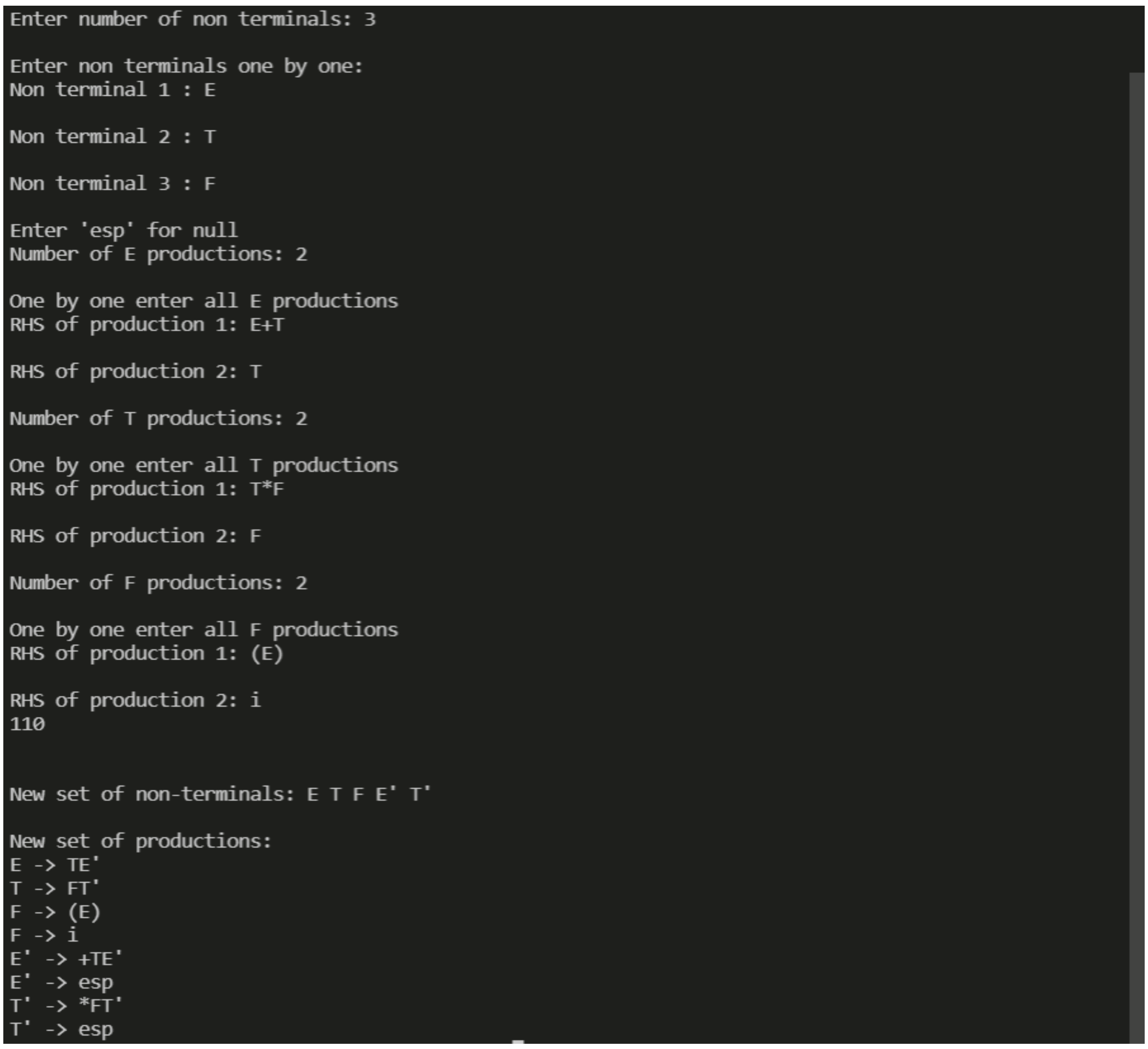
PROGRAM:

```
int main()
{
    int n;
    cout<<"\nEnter number of non terminals: ";
    cin>>n;
    cout<<"\nEnter non terminals one by one: ";
    int i;
    vector<string> nonter(n);
    vector<int> leftrecr(n,0);
    for(i=0;i<n;++i) {
            cout<<"\nNon terminal "<<i+1<<" : ";
        cin>>nonter[i];
    }
    vector<vector<string> > prod;
    cout<<"\nEnter 'esp' for null";
    for(i=0;i<n;++i) {
        cout<<"\nNumber of "<<nonter[i]<<" productions: ";
        int k;
        cin>>k;
        int j;
        cout<<"\nOne by one enter all "<<nonter[i]<<" productions";
        vector<string> temp(k);
        for(j=0;j<k;++j) {
            cout<<"\nRHS of production "<<j+1<<": ";
            string abc;
            cin>>abc;
            temp[j]=abc;
            if(nonter[i].length()<=abc.length()&&nonter[i].compare(abc.substr(
0,nonter[i].length()))==0)
                leftrecr[i]=1;
        }
        prod.push_back(temp);
    }
    for(i=0;i<n;++i) {
        cout<<leftrecr[i];
    }
    for(i=0;i<n;++i) {
        if(leftrecr[i]==0)
            continue;
        int j;
        nonter.push_back(nonter[i]+"'");
        vector<string> temp;
        for(j=0;j<prod[i].size();++j) {
            if(nonter[i].length()<=prod[i][j].length()&&nonter[i].compare(prod
[i][j].substr(0,nonter[i].length()))==0) {
                string
abc=prod[i][j].substr(nonter[i].length(),prod[i][j].length()-
nonter[i].length())+nonter[i]+"'";
                temp.push_back(abc);
                prod[i].erase(prod[i].begin()+j);
                --j;
            }
            else {
                prod[i][j]+=nonter[i]+"'";
            }
        }
        temp.push_back("esp");
        prod.push_back(temp);
    }
    cout<<"\n\n";
    cout<<"\nNew set of non-terminals: ";
    for(i=0;i<nonter.size();++i)
        cout<<nonter[i]<<" ";
    cout<<"\n\nNew set of productions: ";
    for(i=0;i<nonter.size();++i) {
        int j;
        for(j=0;j<prod[i].size();++j) {
            cout<<"\n"<<nonter[i]<<" -> "<<prod[i][j];
        }
    }
    return 0;
}
```

INPUT:

```
E -> E+T
E -> T
T -> T*F
T -> F
F -> (E)
F -> i
```

OUTPUT:



```
Enter number of non terminals: 3

Enter non terminals one by one:
Non terminal 1 : E

Non terminal 2 : T

Non terminal 3 : F

Enter 'esp' for null
Number of E productions: 2

One by one enter all E productions
RHS of production 1: E+T

RHS of production 2: T

Number of T productions: 2

One by one enter all T productions
RHS of production 1: T*F

RHS of production 2: F

Number of F productions: 2

One by one enter all F productions
RHS of production 1: (E)

RHS of production 2: i
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New set of non-terminals: E T F E' T'

New set of productions:
E -> TE'
T -> FT'
F -> (E)
F -> i
E' -> +TE'
E' -> esp
T' -> *FT'
T' -> esp
```